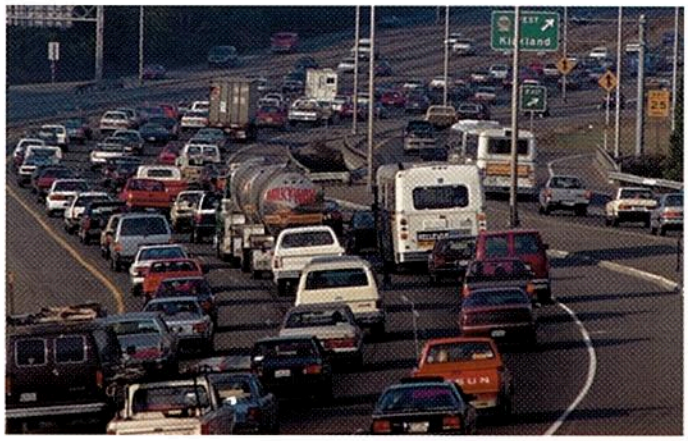
Clearing the Air



A Report on Emission Trends in Selected U.S. Cities

Prepared by

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for

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Clearing the Air
A Report on Emission Trends in Selected U.S. Cities

Key Findings

1. While ground-level ozone continues to be a pervasive problem in many major U.S. cities, automobiles and light trucks are no longer the primary or even secondary cause of summertime ozone "smog" in the 10 cities studied:

Atlanta	Los Angeles
Baltimore	Milwaukee
Boston	New York
Chicago	Philadelphia
Houston	Washington DC

2. Available emission inventories submitted to U.S. EPA by states indicate that autos and light trucks currently represent less than one-third of the overall emissions that lead to the ozone problems in these cities, compared to other polluters.

3. Although cars and light trucks continue to receive critical attention from the news media during ozone alerts, a more complete picture shows significant improvements in auto-related volatile organic compounds (VOCs) and nitrogen oxide (NOx) emissions over the past 35 years -- improvements unmatched by other sources of ozone -- with over a 90% reduction in VOCs and from 15% to 60% for NOx achieved by 2005, relative to 1970.

4. Analysis of local emission inventories from 1970 to 1996 projects that the role of stationary polluters in urban smog, such as refineries, manufacturing plants, and utilities has increased substantially at the same time that the role of the auto is declining.

5. Other mobile sources such as trucks, buses, planes, trains and

other utility and off-road vehicles show similar emission increases in these cities at a time when auto emissions are heading downward.

6. In cities like Baltimore, Houston and Philadelphia, 80% to 90% of the VOC and 70% to 80% of the NOx emissions come from stationary and "other mobile" sources -- more than three times the VOCs and NOx from autos and light trucks.

7. In cities like Atlanta, Boston and Washington DC, 60% to 80% of the VOC and NOx emissions emanate equally from "other mobile sources" like buses and trucks and stationary sources -- more than twice the VOCs and NOx from autos and light trucks.

8. Continued tightening of Federal tailpipe emission standards, cutting hydrocarbon and NOx levels by 96% and 76% respectively over the past 25 years, is the single largest reason for the improvement in urban air quality -- more than offsetting the growth in vehicle miles traveled (VMT) experienced in all 10 cities studied.

9. Programs such as new auto emission and light truck emission standards, periodic emission inspections and Reformulated Gasolines will be extremely effective in reducing auto-related ozone problems after 1996.

10. Although continued efforts must be made to achieve healthful air quality, automobiles and light trucks should be treated in the future as just two of many ozone-related emission sources.

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What's At Issue

The findings of the AAA-EEA "Smog" study run counter to the popular perception that urban ozone problems are caused primarily by passenger vehicles on heavily congested highways during rush hours. They appear against a backdrop of the massive requirements of the Clean Air Act Amendments of 1990, which are heavily targeted on controlling auto emissions. For instance, the Act calls for:

- A major high-tech expansion of the vehicle emission inspection/maintenance (I/M) programs covering 177 urban areas, affecting 75 million motorists.
- The sale of "oxygenated" gasoline in nearly 40 major cities to control wintertime pollution problems, and "reformulated gasoline" in at least 13 states with summertime pollution problems.
- Requiring government agencies, utilities and major private vehicle fleet operators in 22 states to purchase alternative-fueled vehicles.
- Requiring large employers in 10 major cities to impose mandatory ride-sharing and transit incentive programs on employees to reduce single-occupant vehicles by 25 percent during rush hours.
- New, tighter tailpipe emission standards on autos and light trucks to reduce pollutants by more than the 76% to 96% reductions that have already been achieved by current model vehicles.
- Imposition of new "on-board" evaporative emission canisters on all light-duty vehicles to capture VOCs released during refueling.
- Permitting states to impose a wide assortment of transportation control measures to discourage the use of vehicles during rush hours in most major cities, such as:

    -- Parking bans, limits and surcharges
    -- "Carless" day programs
    -- "Congestion Pricing" fees and other tolls
    -- Vehicle registration surcharges on older and less fuel efficient cars
    -- Additional taxes based on annual vehicle mileage

Sources of "Smog" in Selected Cities

% of VOCs and NOx from All Sources in 1996

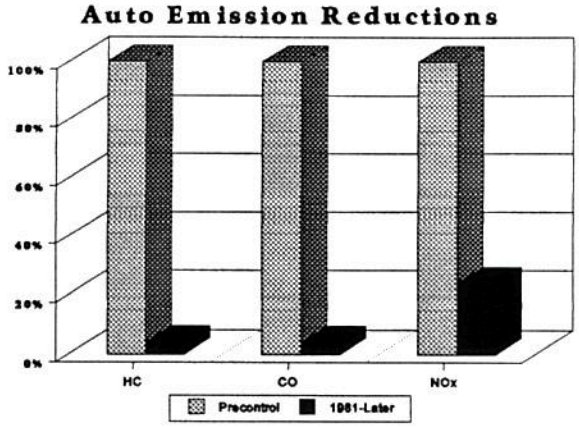
	Stationary		Other Mobile		Light Trucks		Autos	
	VOC	NOX	VOC	NOX	VOC	NOx	VOC	NOx
Atlanta	41%	21%	28%	46%	11%	11%	20%	22%
Baltimore	60	40	21	37	6	7	13	16
Boston	48	31	37	39	2	5	13	25
Chicago	54	20	22	51	4	5	20	24
Houston	68	43	21	35	4	8	7	14
Los Angeles	52	7	23	63	7	9	20	21
Milwaukee	63	35	16	35	6	7	16	23
New York	51	41	24	37	10	8	15	14
Philadelphia	70	46	19	34	4	7	7	13
Washington DC	46	32	30	48	9	7	15	13

AAA - EEA Smog Study 1994

Progress in Auto Tailpipe Emission Reductions

Federal Emission Standards (grams per mile)

Model Year	HC	CO	NOx
	% Reductions		
Precontrol	----	----	----
1968-1971	62%	60%	----
1972-1974	72%	67%	24%
1975-1976	86%	82%	24%
1977-1979	86%	82%	51%
1980	96%	92%	51%
1981-1982	96%	96%	76%
1983-1993	96%	96%	76%

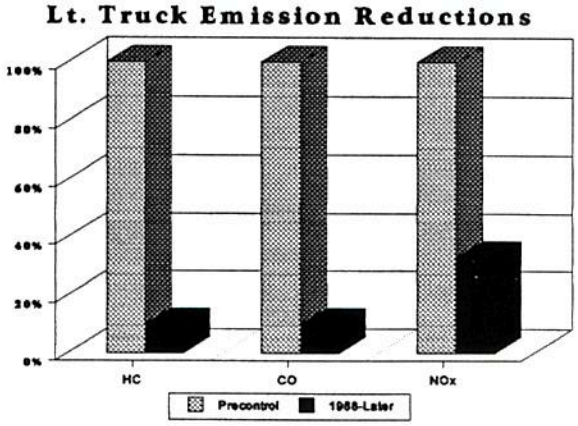


Federal standards have resulted in a 96% reduction in hydrocarbon (HC) and carbon monoxide (CO) emissions and a 76% reduction in nitrogen oxide (NOx) emissions from late-model cars compared to precontrol cars. (See Above) **Standards for light trucks have resulted in 90% reductions in HC and CO emissions and 53% to 67% reductions in NOx.** (See Below)

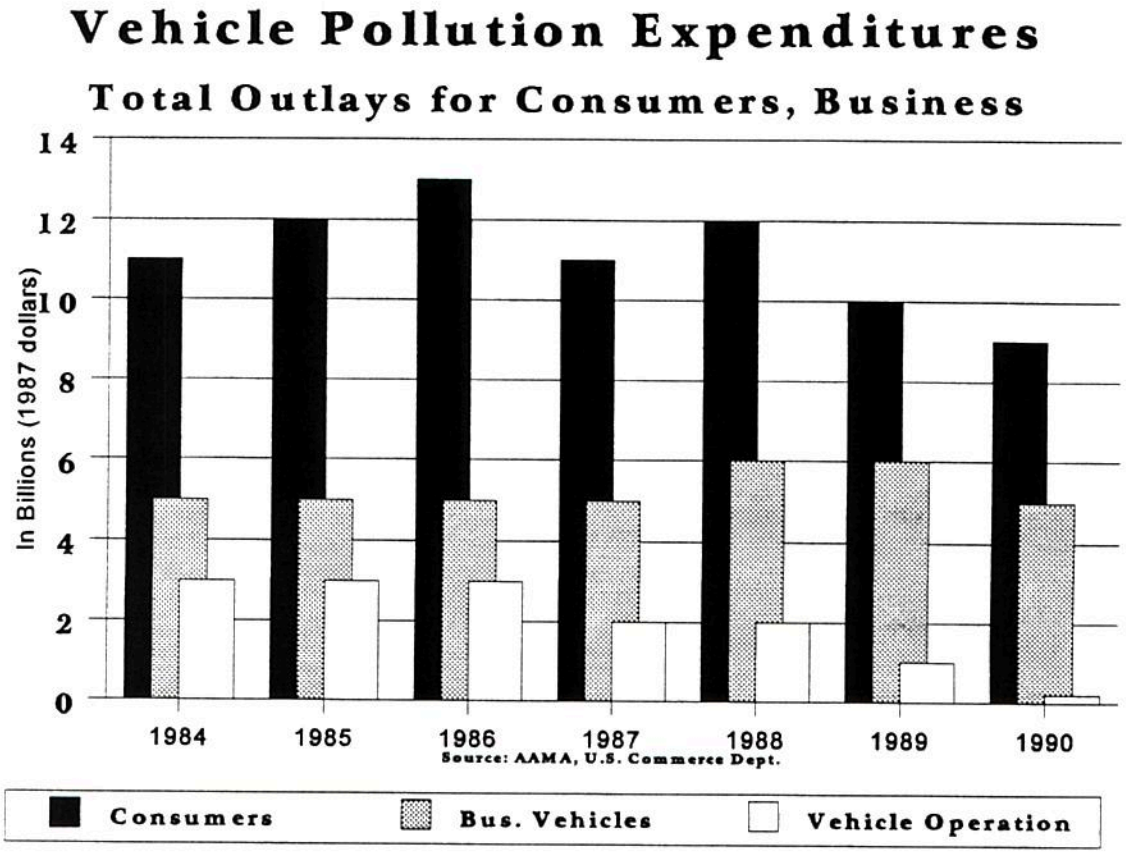
Progress in Lt. Truck Tailpipe Emission Reductions

Model Year	HC	CO	NOx
	% Reductions		
Precontrol	----	----	----
1975-1978	75%	80%	14%
1979-1983	79%	82%	36%
1984-1987	90%	90%	36%
1988-Later:	90%	90%	53%-67%*

* Depending on weight



Source: AAMA, U.S. EPA



Consumer expenditures for emission control devices on motor vehicles have averaged $10 billion, business vehicle emission expenditures have averaged $5 billion, and vehicle operating expenditures have averaged $2 billion -- for a total of $17 billion annually for vehicle - related emission abatement.

Average Retail Price Increases
1968 - 1993 Automobiles
To Meet Federal Emission Standards
(Adjusted to 1992 Dollars)
Source: AAMA, U.S. Bureau of Labor Statistics

Model Year	Price Increase
1968	$ 39.69 Per Car
1969	00.00
1970	13.28
1971	44.06
1972	14.04
1973	64.70
1974	3.09
1975	242.57
1976	14.54
1977	26.00
1978	16.87
1979	18.93
1980	170.92
1981	637.47
1982	111.28
1983	82.83
1984	73.33
1985	24.21
1986	00.00
1987	00.00
1988	00.00
1989	00.00
1990	00.00
1991	00.00
1992	00.00
1993	00.00
Total:	**1597.81 Per Car**

*Includes changes to improve fuel economy and emission control.

Improvements to engine emission control systems have resulted in incremental retail price increases on new cars since 1968 which totalled nearly $1,600 per car as of 1993.

Contents

Ground-level ozone continues to be a pervasive air pollution problem throughout the United States. Ozone, which forms when emissions of volatile organic compounds (VOCs) and oxide of nitrogen (NOx) react in the presence of sunlight and heat, reaches unhealthy levels in nearly every major metropolitan area of the country on at least a few days each summer.

VOCs are generated through the combustion of carbon-based fuels (such as gasoline, natural gas, propane and fuel oil) and are emitted directly from such common products as commercial and household solvents, paints and hygiene products. VOCs are used in many consumer products, both as active ingredients (as is the case with many cleaning solutions), and as secondary ingredients that enhance the overall utility or functionality of other ingredients — as is the case with paints and hygiene products where VOCs act as carriers and propellants that evaporate upon release into the air.

NOx also is generated through combustion of fuels. However, unlike VOCs, which form when fuel-based hydrogen and carbon are released as products of incomplete combustion, NOx is generated from the reaction of oxygen and nitrogen present in air. While the nitrogen-oxygen reaction does not occur frequently under normal atmospheric conditions, the high-temperature, high-pressure combustion of fuel that occurs within the engines of cars and light trucks, as well as within comercial, residential, industrial, utility processing and heating equipment, can lead to significant NOx formation.

Because automobiles and light trucks continue to receive attention as the principal contributors to urban ozone, it is important that the complete picture of VOC and NOx emitters, as well as progress in emission reductions to date, be understood. This report presents data on the emissions inventories of VOC and NOx over the last 25 years in 10 cities scattered geographically throughout the country, as well as a forecast of those emissions inventories a decade from now. Furthermore, the emissions inventories are provided by source, allowing for a more complete view of the contributors to ozone and the relative effectiveness of past and future emission control efforts.

This report focuses on the VOC and NOx emissions inventories in Atlanta, Baltimore, Boston, Chicago, Houston, Los Angeles, Milwaukee, New York, Philadelphia and Washington, D.C. These 10 cities represent areas in which some of the nation's most severe ozone problems exist, and they provide a look at cities in the eastern, central and western portions of the United States. As can be seen from the data, the trends related to VOC and NOx emissions by source are very similar throughout the 10 cities and, therefore, are likely to be good indicators of trends in other U.S. cities not specifically included in this report.

While every effort was made to obtain the emissions data presented in this report from appropriate air quality planning agencies, this was not always possible. Both VOC and NOx emission inventories for 1990 and VOC emissions inventories for 1996 were obtained from appropriate air quality planning staff for all 10 cities. Emissions inventories for 1980 and 1987 were available for a subset of the 10 cities, but these inventories were developed some years ago using methodologies, models and geographic boundaries which vary substantially from those used today. For a few cities, VOC inventories for several future years beyond 1996 also were available.

To develop a consistent picture of historical, current and future VOC and NOx emissions inventories across time, the 1990 and 1996 inventories provided by appropriate air quality planning agencies form the basis of the data presented in this report. Using the 1990 and 1996 data, as well as emission control and inventory trends derived from previously developed inventories and computer models for earlier years, corresponding inventories for 1970, 1980 and 2005 were developed for each city.

The emission inventories presented in this report are not intended to replicate the work performed by air quality planning staff. Geographical boundaries for the inventories in the report may differ somewhat from that used for official air quality planning purposes, and small inaccuracies may result from the use of trend-based relationships to derive past and future inventories. Nevertheless, any inaccuracies will be sufficiently small so that the general trends presented in this report are valid.

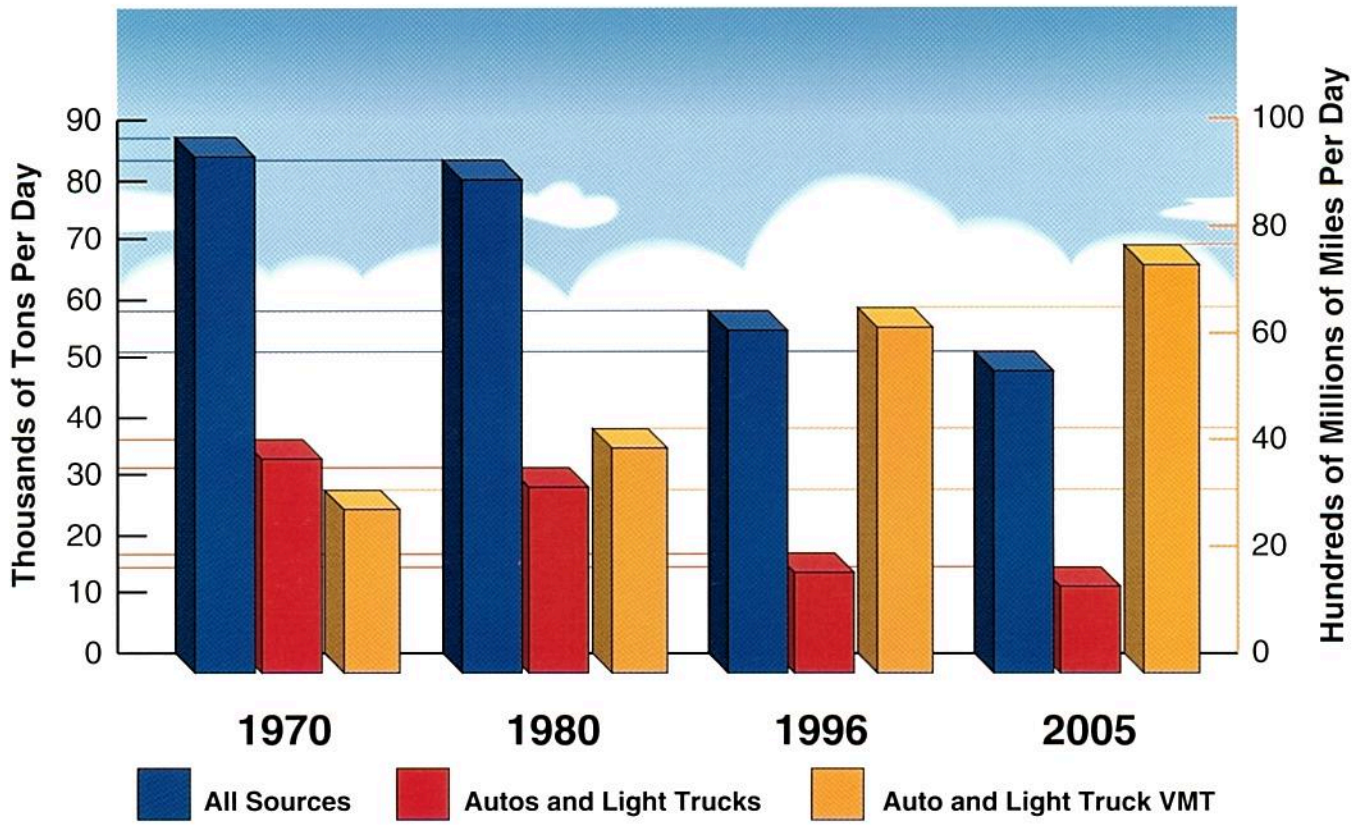
In viewing the 2005 emissions inventories, the reader is cautioned that air quality planning agencies in each of the 10 cities are still in the process of formulating their post-1996 emissions control strategies. As a result, emissions from each source may change significantly from the levels presented, depending on which emission control strategies are eventually adopted. However, the inventories presented in this report provide an estimate of where the emission inventories of each of the cities will be in 2005 if no additional control programs are implemented.

In reviewing the emission inventories, the reader will note that control of automobile and light truck emissions has been the largest single reason for VOC and NOx emission reductions observed over the last 25 years. Additionally, both VOC and NOx emissions from automobiles and light trucks are expected to continue to decline over the next decade. Reductions in automobile emissions of over 90 percent for VOCs and from 15 percent to 60 percent for NOx will be achieved by 2005, compared to considerably lower reductions from other emission sources, relative to 1970. Equally telling is the fact that these VOC and NOx emission reductions have been achieved despite substantial increases in vehicle miles of travel.

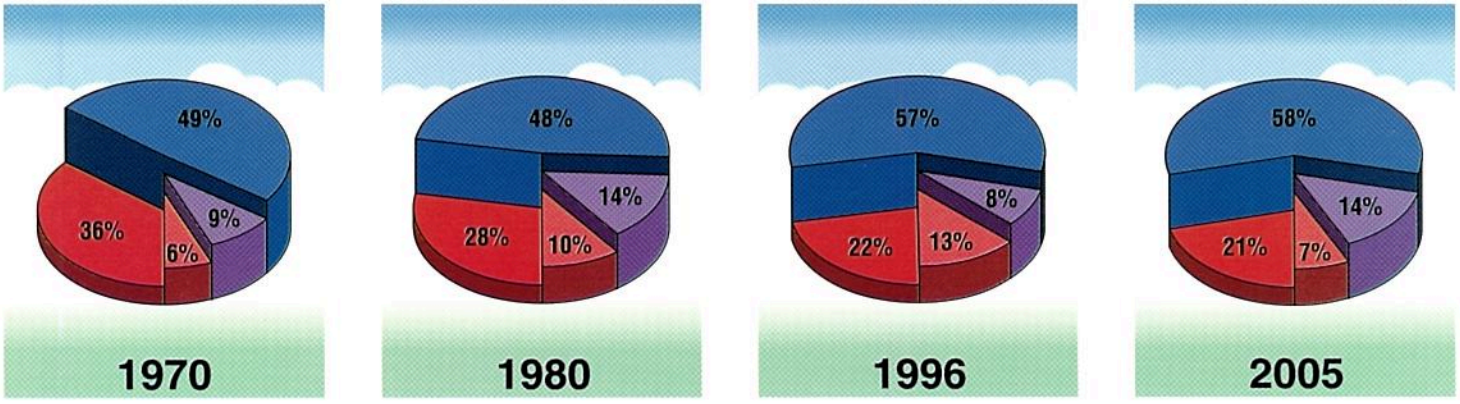
Clearly, automobile and light truck emission reductions have outpaced reductions in emissions from other sources. Programs such as new vehicle emission standards, periodic vehicle emission inspections and reformulated gasolines have been or will be extremely successful. At the same time, control programs of similar stringency have not been established for other VOC and NOx emission sources. Since it is clear that continuing emission reductions will be necessary to achieve healthful air quality, it is essential that emission controls for all sources be evaluated and that automobiles and light trucks be treated as but one of the many ozone-related emission sources.

(The following charts are accurate to within +/- 1%.)

National VOC Emissions

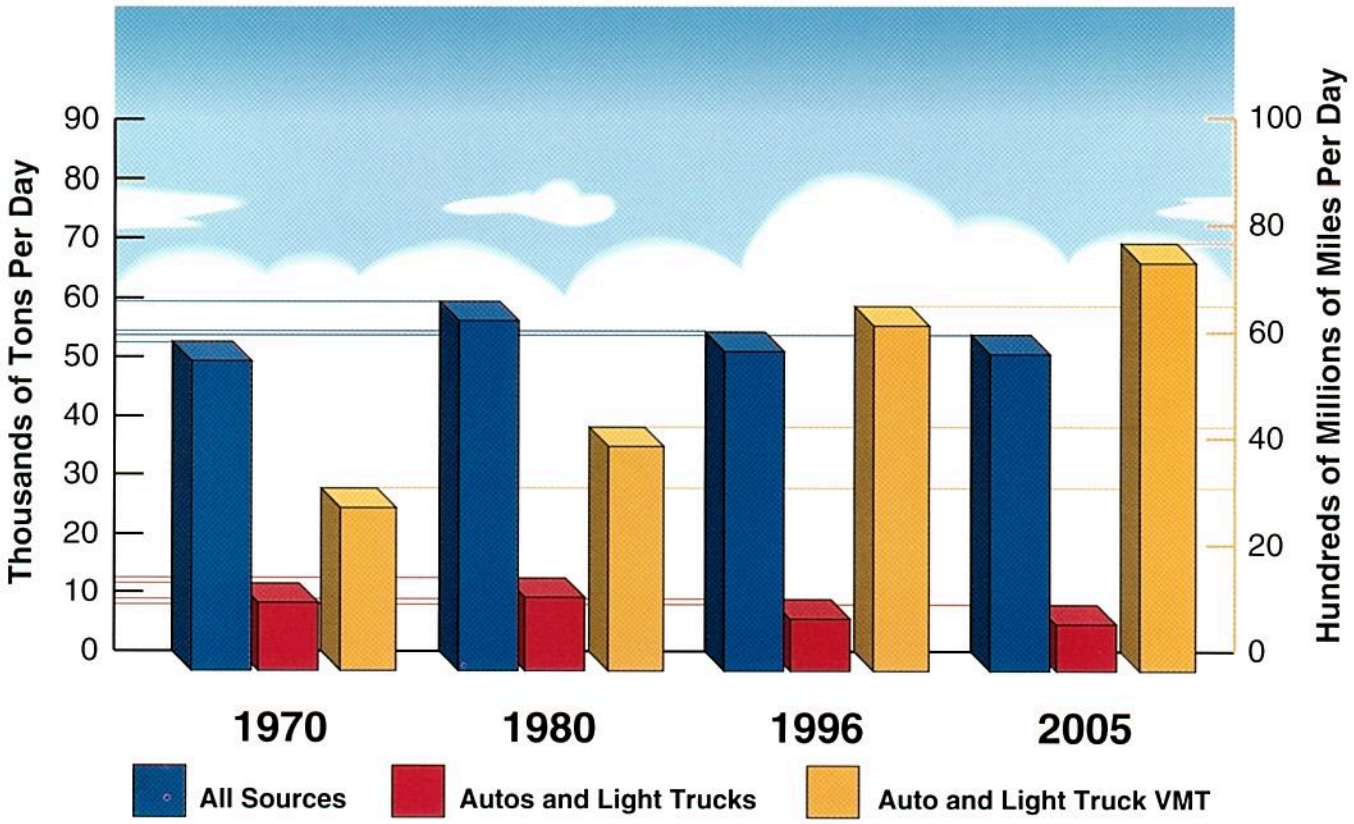


National VOC Emissions by Source

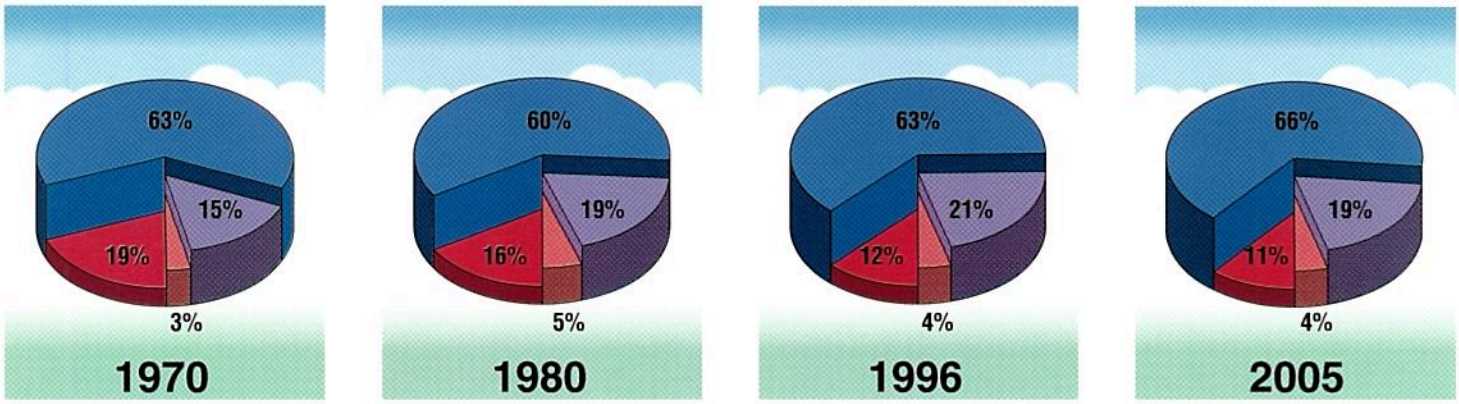


Source: Energy and Environmental Analysis, Inc.

National NOx Emissions



National NOx Emissions by Source



Source: Energy and Environmental Analysis, Inc.